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## Can I just check...? Effects of edit check questions on measurement error and survey estimates

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# Can I just check...? Effects of edit check questions on measurement error and survey estimates

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## Non-technical summary

Household income is a key measure of social welfare and as such it is important for policy analyses. Household income is however difficult to measure in surveys, since it requires collecting information about *all* potential income sources for *each* member of a household. Respondents often forget to report some sources of their income and estimates of household income – and other related estimates such as poverty rates – are therefore likely to be biased.

This paper evaluates the effects of two changes in the measurement of household income that were implemented in the British Household Panel Survey (BHPS) from 2005 onwards. Since then two types of edit checks have been used during the interview, to verify respondents' reports. The first type of edit check uses answers the respondents gave earlier in the same interview to check for income sources they might be eligible for but have not reported. The second type of edit check uses respondents' answers from the previous interview, to check whether they are still receiving income sources they have reported in the past. The BHPS implemented these edit checks in a quasi-experimental way, so that it is possible to compare responses, and the household income derived from individual respondent's interviews, obtained with and without the edit checks. In addition we use experimental data from a validation study with a similar design as the BHPS, to check whether the changes in responses due to the edit checks reflect improvements in data quality.

We document how many income sources are reported in response to the edit check questions, which were not mentioned in response to the original survey questions. The results from the validation study suggest that the additional responses represent a reduction in various aspects of measurement error. The additional reports increase the estimated household incomes of poor households, but neither have much effect on the estimated proportion of people living in poor households, nor on the proportion of people entering and exiting poverty.

## Can I just check...?

### Effects of edit check questions on measurement error and survey estimates

Peter Lugtig (Utrecht University) and Annette Jäckle (University of Essex)

#### Abstract

Household income is difficult to measure, since it requires collecting information about all potential income sources for each member of a household. We assess the effects of two types of edit check questions on measurement error and survey estimates: within-wave edit checks use responses to questions earlier in the same interview to query apparent inconsistencies in responses; dependent interviewing uses responses from prior interviews to query apparent inconsistencies over time. The findings suggest that traditional interviewing methods underestimate household income in the lower tail of the income distribution, but that neither edit check method has much effect on estimated poverty rates or transition rates in poverty.

**Keywords:** Dependent Interviewing, validation study, record check, panel survey, British Household Panel Survey, unearned income, non-labor income, cash transfer, household income, poverty, low income

**JEL classification:** I32, C83

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## 1 Introduction

Household income is a key measure of social welfare and as such important for policy analyses. Some surveys, such as the European Social Survey, ask one household member a single question about their income: “Using this card, please tell me which letter describes your household's total income, after tax and compulsory deductions, from all sources? If you don't know the exact figure, please give an estimate.”<sup>1</sup> Surveys for which income is a key outcome measure more commonly ask a host of questions about each potential source of income, including questions about receipt status, timing of receipt and amounts received. Total income has to be computed from these questions and aggregated over all income sources and all household members. Reporting in detail on all aspects of household income is a difficult and potentially tedious task for respondents. As a result, household income is likely to be measured with error and estimates derived from it, such as poverty rates or income dynamics over time, may be biased.

In this paper we assess the effects of edit check questions, which are incorporated into the questionnaire to detect and correct potential reporting errors, on estimates derived from detailed questions about household income. We examine the effects of both within-wave and cross-wave edit checks. *Within-wave edit checks* use information collected earlier in the same interview to check the consistency of answers. For example, respondents can be queried about sources they have not reported, but for which they are likely to be eligible, judging from responses given earlier in the interview (Pennell 1993). *Cross-wave edit checks* are specific to longitudinal surveys. They use information provided in previous interviews to check the longitudinal consistency of responses. For example, respondents can be queried about sources they have reported in the past, but not in the current interview (see Jäckle 2009; Mathiowetz and McGonagle 2000). Cross-wave edit checks are typically referred to as ‘dependent interviewing’ (DI) and we follow this convention.

The key question examined here is to what extent edit checks affect estimates of household income and poverty. Previous validation studies have mainly focused on measurement error in receipt status for individual income sources. These studies have shown that some non-labor income sources are considerably under-reported and that DI improves reporting (Lynn et al. in press). Other studies have examined measurement error in the timing of receipt and shown that DI reduces errors in monthly transition rates (Moore et al. 2009) and spell durations (Jäckle 2008). The effects on monetary amounts have to our knowledge

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<sup>1</sup> The European Social Survey questionnaires can be downloaded from <http://www.europeansocialsurvey.org>.

not been examined. Neither have the effects on estimates related to total (household) income. Although the reduction of error in individual survey questions can be substantial, it is not a priori clear what effect this methodological improvement has on estimates that are derived from a series of detailed questions about all components of household income.

We contribute to this literature by examining to what extent edit checks affect estimates of household income, poverty rates and transitions into and out of poverty. For this purpose we use three waves of the British Household Panel Survey (BHPS), in which both within-wave edit checks and DI are used in a quasi-experimental way. In order to ascertain whether the effects on survey estimates reflect an improvement in data quality, we further use data from an experimental study carried out in the context of the BHPS, which linked survey responses to individual administrative records. The results suggest that traditional methods of interviewing under-estimate household income in the lower tail of the income distribution. Estimated poverty status and poverty transitions however hardly change. The changes in estimates appear to reflect a reduction in measurement error in the reporting and duration of receipt, thus reflecting an improvement of data quality.

## **2 Data**

### **2.1 The British Household Panel Survey (BHPS)**

The BHPS is a panel survey of the UK population that started in 1991 with a clustered and stratified address-based sample of 5,500 households. All household members aged 16+ are interviewed annually and followed as long as they remain in the UK. The individual response rates, conditional on response in the prior wave, are around 94% (RR1 – AAPOR 2008) for the waves included in our analyses (Taylor et al. 2009).

Income data are collected in two sections of the questionnaire: one on labor earnings and another on non-labor income (including State cash transfers, private pensions, private transfers and investment income). Edit checks are only used for non-labor income and we therefore focus on those questions.<sup>2</sup> In the original version, respondents are shown a series of four showcards, listing 34 potential income sources, and asked which of these they have received during the reference period: *“Please look at this card and tell me if, since September 1<sup>st</sup> <previous calendar year>, you have received any of the types of income or payments shown, either just yourself or jointly?”* For each income source reported, respondents are then asked a series of follow-up questions about the timing and amounts of receipt: *“And for*

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<sup>2</sup> The BHPS questionnaires can be accessed at <http://www.iser.essex.ac.uk/survey/bhps>.

*which months since September 1<sup>st</sup> <previous calendar year> have you received <source>?”, “How much was the last payment of <source> you received?”, and “What period did that cover?”*

From 2005 the BHPS added within-wave edit checks for those cash transfers, for which questions earlier in the same interview predict eligibility: Pension Credit, Disability Benefits, Income Support, Job Seekers’ Allowance, Child Benefit and Housing Benefit. For example, respondents above the State retirement age who have not reported a State pension are asked “*Can I just check, do you currently receive the State Retirement Pension?*”

From 2006 onwards, reactive dependent interviewing (RDI) was added for all non-labor income sources (see Jäckle, Laurie, and Uhrig 2007). Respondents are first asked the original question. For any income sources reported in the previous but not the current interview, they are asked a follow-up question: “*Can I just check, according to our records you have in the past received <source>. Have you received <source> at any time since <date of interview>?*”

Although the BHPS data are not experimental, the public release file identifies which income sources were reported in response to the initial question, which in response to the within-wave edit check, and which in response to the RDI follow-up question. This enables a quasi-experimental comparison of the effects of the interviewing method on responses and estimates.

## **2.2 The experimental validation study**

The experimental study was carried out using the former European Community Household Panel (ECHP) low-income sub-sample for Great Britain. This sample had been surveyed as part of the BHPS since 1997 until funding expired in 2001. In 2003 the sample was interviewed once more for methodological purposes. The methodological survey included a split-ballot experiment comparing independent and dependent interviewing for various sections of the questionnaire. In addition, respondents were asked for permission to link to their records from the Department for Work and Pensions (the department in charge of administering cash transfers). The response rate for the methodological survey was 89% (RR1 - AAPOR 2008), of which 77% gave consent for the record linkage (Jäckle et al. 2004), of which 74% were successfully linked. Those not linked were probably respondents who had not received cash transfers during the time frame of interest, although some problems with the identifying information used for the linkage cannot be excluded (see Jenkins et al. 2008).

In the experimental survey, three versions of questions on non-labor income components were randomly assigned: independent interviewing (INDI), reactive dependent interviewing (RDI) and proactive dependent interviewing (PDI). Since the BHPS uses RDI for the income questions, the analyses presented here focus on the comparison of INDI and RDI. The INDI version used the original BHPS question, as described in Section 2.1. The RDI version had an added edit check question, again as described in Section 2.1. Respondents in both experimental conditions were asked the same series of follow-up questions, described in Section 2.1, about the timing and amounts of each income source.

The administrative records contain information about which State cash transfers each respondent has received, including the dates of receipt and amounts received. A few transfer types included in the survey are not included in the records (Widowed Mother's Allowance, War Disability Pension, Council Tax Benefit). Some cash transfer types (Disability Living Allowance, Child Benefit) are recorded as a single source, while the survey collects separate information about different components (e.g. care component vs. mobility component). For comparability, the experimental survey data were edited to reflect the data structure of the records.

### **2.3 Comparability of the BHPS and experimental validation data**

Although the experimental validation and BHPS data are based on the same survey design, there are several differences between the surveys which are relevant to our analyses:

- 1) Time frames: The BHPS data are from 2005, 2006 and 2007, while the experimental data are from 2001 and 2003.
- 2) Sample composition: the BHPS is a general population sample, while the experimental data over-represent low-income households and may be affected by selection bias due to non-consent to linkage.
- 3) Dependent interviewing method: the BHPS used RDI for all sample members, in 2006 and 2007, while the experimental survey used INDI in 2001 and experimentally allocated respondents to a DI treatment in 2003.
- 4) Within-wave edit checks: the BHPS used within-wave edit checks for questions on cash transfer receipt in 2005, 2006 and 2007 surveys, while the experimental study did not use any within-wave edit checks.



## 2.4 Data description

For analysis purposes, we group the income sources into four components of non-labor income: State cash transfers, private pensions, other transfers and investments. This grouping corresponds to the derived income components provided with the BHPS public release file and consists of the following income components:

- (1) State cash transfers: 4 types of national insurance pensions and tax credits, 10 types of disability related cash transfers and tax credits, 2 types of income support, Housing Benefit, Council Tax Benefit, Job Seekers Allowance, Child Benefit, Maternity Allowance, Working Families Tax Credit, Child Tax Credit.
- (2) Private pensions: 3 types of private pensions.
- (3) Other transfers: education grants, sickness insurance, maintenance/foster allowance, payments from trade unions/friendly societies, payments from absent family members, other payments.
- (4) Investment income: rent from boarders/lodgers, rent from other properties.

Labor income also contributes to household income. We do, however, not examine this component separately, because edit check questions were not used for the collection of labor income data.

Table 1: Number of income sources reported in the BHPS

		Cash transfers	Pensions	Other transfers	Investment
Wave 15	INDI	8088	1717	426	274
	WVEC	117	–	–	–
Wave 16	INDI	8170	1776	515	323
	WVEC	165	–	–	–
	RDI	615	121	55	39
Wave 17	INDI	7895	1846	501	302
	WVEC	157	–	–	–
	RDI	506	94	49	423

Notes: Number of respondents at wave 15: 8,538, wave 16: 8,484, wave 17: 8,322.

INDI: independent interviewing, WVEC: within-wave edit check, RDI: reactive dependent interviewing

The number of income sources reported in the BHPS is documented in Table 1, for the 2005 survey (wave 15), 2006 (wave 16) and 2007 (wave 17). In wave 16, for example, respondents reported receipt of a total of 8,170 State cash transfers when asked the original BHPS question. Respondents for whom information collected earlier in the interview suggested that they might be eligible for additional cash transfers, were then asked the within-wave edit check, whereupon they reported a further 165 sources. Finally, all respondents were queried about sources they had reported in the previous interview using the RDI edit check question,

whereupon they reported a further 615 income sources. As described in Section 2.1, the within-wave edit check questions were only used for State cash transfers. For the other types of non-labor income only the RDI edit check was used.

The sample sizes in the experimental survey and validation data are documented in Table 2. Of the sample allocated to INDI, 262 respondents consented to the linkage. These respondents reported a total of 338 State cash transfers in the 2003 survey, while the administrative records for these respondents, corresponding to the same time period, list 374 cash transfers.

Table 2: Sample sizes in the experimental validation data

	Respondents consented to linkage	Income sources in records	Income sources in survey
INDI	262	374	338
RDI	274	407	401

Notes: INDI: independent interviewing, RDI: reactive dependent interviewing

### 3 Results

#### 3.1 Effects of edit checks on survey estimates

##### Effects on the distribution of household income

To examine whether edit checks affect estimates of household income, we use waves 15 to 17 of the BHPS. Table 3 shows estimates of the equivalized annual household income distribution for the population of Great Britain. The estimates are based on all members of surveyed households, adjusted for differences in household size using the McClements equivalence scale (Taylor et al. 2009) and weighted for non-response. The first column indicates the estimated income percentiles including only income sources reported in response to the INDI questions. The second column indicates by how much the income percentile changes when income sources reported in response to the within-wave edit checks are included. For waves 16 and 17, the third column indicates by how much the INDI estimate changes if sources reported both in response to the within-wave edit checks and the RDI follow-up questions are included.

Within-wave edit checks have a considerable effect, increasing estimated income percentiles below median income, for example increasing household income for the fifth percentile by 6% at wave 16. RDI has an additional effect, increasing the fifth percentile by a further four percentage points to 10%. The effects of RDI and edit checks are largest for people in the lowest percentile, monotonically fall across percentiles, and are zero, or close to zero for all percentiles above the median. The effect on median income is small: when

sources reported in response to the within-wave edit checks are included, the estimated median increases by less than 0.3% in each of the three waves, and by a further 1% at waves 16 and 17 when responses to RDI are included.

Edit checks therefore increase estimates of household income at the lower end of the income distribution, where cash transfers, pensions and other transfers are likely to represent a major component of total income. For households with higher levels of income, these sources are likely to be less important, while investment income may contribute a large part of total income. Nonetheless, the edit checks do not have any effect at the upper tail of the income distribution.

Table 3: Distribution of equivalized annual household income

Percentile	Wave 15		Wave 16			Wave 17		
	INDI (£)	INDI+ (% Δ)	INDI (£)	INDI+ (% Δ)	INDI++ (% Δ)	INDI (£)	INDI+ (% Δ)	INDI++ (% Δ)
1	1609	49	436	183	210	842	95	137
2	3740	6	2780	31	35	3205	26	32
5	6047	5	6073	6	10	6385	4	7
10	8353	1	8549	2	6	8630	2	6
25	13594	0	13881	0	3	13847	1	4
50	25192	0	25267	0	2	25594	0	1
75	40921	0	41106	0	1	42472	0	1
90	57812	0	58602	0	0	61828	0	0
95	71091	0	73977	0	0	75365	0	0
98	89872	0	93273	0	0	96199	0	0
99	107793	0	109815	1	1	115145	0	0

Notes: Based on all BHPS enumerated household members, wave 15: 11,700, wave 16: 11,611, wave 17: 11,374.

INDI: Income derived from independent interviewing questions only, INDI+: plus within-wave edit checks, INDI++: plus reactive dependent interviewing. (£): annual equivalized household income. (% Δ): percentage change compared to INDI only.

### Effects on estimated poverty rates

To examine whether edit checks affect estimated poverty rates, we again use waves 15 to 17 of the BHPS. We define the poverty threshold as 60% of median annual household income: any individual living in a household with less income is classified as poor. Official poverty statistics are frequently based on current income (Department for Work and Pensions 2008). We focus on annual income, in order to examine the net effects of edit checks on all questions related to household income, including questions about the timing of receipt during the year. In addition, Böheim and Jenkins (2006) show that there are few differences between poverty indicators based on current and annual income.

Table 4: Poverty rates (%)

Wave	Interviewing method	'Poor'	INDI: 'poor' Edit check: 'not poor'	INDI: 'not poor' Edit check: 'poor'
15	INDI	18.6	–	–
	WWEC	18.5	0.8	0.0
16	INDI	18.9	–	–
	WWEC	18.8	0.9	0.1
	RDI	18.4	4.2	0.4
17	INDI	18.4	–	–
	WWEC	18.2	1.2	0.0
	RDI	17.9	3.9	0.3

Notes: Based on all BHPS enumerated household members, wave 15: 11,700, wave 16: 11,611, wave 17: 11,374. INDI: independent interviewing. WWEC: within-wave edit check. RDI: reactive dependent interviewing.

The results in Table 4 suggest that the edit checks somewhat reduce estimated poverty rates, but the effects are very small. Nonetheless, some individuals are classified differently depending on the interviewing method. For example, at wave 16, 4.2% of individuals are classified as 'poor' based on the INDI questions, and as 'not poor' when the income sources reported in response to the edit checks are added. Similarly, the third column shows that some individuals classified as 'not poor' with INDI are classified as 'poor' when information from the edit checks is added. These are probably households whose income is only just above the poverty threshold based on the INDI data, which did not report any additional income sources in response to the checks or RDI, and therefore slip just below the poverty threshold when this includes the edit check and RDI responses.

### Effects on estimated poverty transitions

To examine whether edit checks affect the longitudinal consistency of poverty classifications across waves, we again use BHPS data. Table 5 shows the transitions in poverty status between waves 15 and 16, and waves 16 and 17, based on the INDI data only, adding the within-wave edit check data, and further adding the RDI data. The edit checks have little effect on transition rates in both wave-pairs: in the INDI data about 76% of individuals were living in non-poor households in both waves, 13% were poor in both waves, around 5% entered poverty and a further 5% exited poverty from one wave to the next. These estimates are similar when data from the within-wave edit checks and RDI are added. The lack of effects is surprising, since we would have expected RDI to increase the consistency of

responses across waves, and by implication to reduce changes in household income and resulting changes in poverty status across waves.

Table 5: Transition rates into and out of poverty (%)

Wave	Transition type	INDI	INDI+WWEC	INDI+WWEC+RDI
15-16	Persistent non-poor	76.3	76.4	–
	Persistent poor	13.1	13.0	–
	Transition into poverty	5.6	5.7	–
	Transition out of poverty	4.9	5.0	–
16-17	Persistent non-poor	76.3	76.5	77.0
	Persistent poor	13.2	13.2	12.9
	Transition into poverty	5.0	4.8	4.8
	Transition out of poverty	5.5	5.5	5.3

Notes: Based on all BHPS enumerated household members, N wave 15-16:10,278, wave 16-17: 9,692. INDI: independent interviewing. WWEC: within-wave edit check. RDI: reactive dependent interviewing.

In sum, both within-wave edit checks and RDI increase estimates of household income at the lower end of the distribution, but neither method has much effect on poverty classifications or transitions. The next section examines whether the changes in household income reflect an improvement in data quality.

### 3.2 Effects of RDI and edit checks on measurement errors

We use the validation data to examine various aspects of measurement error related to the estimates presented in section 3.1. We examine measurement error in receipt status, amounts of income, duration of receipt and transitions in receipt status between waves. For each of these aspects we examine the extent of measurement error with independent interviewing, and how this changes with RDI. We expect the changes in responses with RDI to reflect a reduction in the various aspects of measurement error, and therefore expect the changes in estimates in section 3.1 to reflect improvements in data quality.

#### Effects of RDI on measurement error in receipt of income sources

We first examine the effect of RDI on measurement error in individual reports of income receipt. We compare responses to the experimental survey with individual register data. For each potential income source, we derive indicators of whether or not the source was received at any point during the reference period. Separate indicators are derived for the survey and the record data and used to classify all potential income sources for each respondent: *true negatives* are income sources which were neither received according to the survey, nor according to the records; *true positives* are income sources which were received both

according to the survey and the records; *false negatives* are income sources which were received according to the records, but not reported in the survey; *false positives* are income sources which were not received according to the records, but reported in the survey. To account for the possibility that respondents may report income sources which are recorded in the name of a different household member in the record data, income sources are counted as ‘true positives’ if there is a record for the source in the name of another household member.

Table 6 indicates the number of potential income sources which are classified as true/false positives/negatives. Assuming that the record data represent the true values, we interpret ‘false negatives’ as indicators of under-reporting, and ‘false positives’ as over-reporting. The last two columns indicate the corresponding error rates: the false negative rate is the number of false negatives as a proportion of sources received according to the records; the false positive rate is the number of false positives, as a proportion of the sources not received according to the records.

Table 6: Effect of RDI on measurement error in income receipt reported by individuals

	Sample sizes (N)			Error rates (%)		
	True negative	False negative	False positive	True Positive	False negative rate	False positive rate
INDI	3257	73	26	312	19.0	0.8
RDI	3377	58	30	371	13.5	0.9

Notes: The sample includes all respondents (INDI=262, RDI=274), multiplied by 14 potential income sources. Columns are defined in the text. INDI: Independent Interviewing, RDI: Reactive Dependent Interviewing.

The results indicate that the main type of error is under-reporting: with INDI 19.0% of sources recorded in the records are not reported in the survey, while over-reporting hardly occurs (less than 1%). RDI reduces the false-negative rate to 13.5% and does not have any effect on over-reporting. The increase in the reporting of income sources with RDI therefore represents a reduction in net measurement error in receipt of income sources.

### **Effects of RDI on measurement error in the amounts of non-labor income**

Second we test the effects of RDI on measurement error in the *amount* of income, again comparing the survey reports to the individual records. For each source we derive the amount of the last payment during the reference period, according to the survey and according to the records. The amounts are standardized to weekly amounts, for comparability with the format in which they are recorded in the administrative data. We then calculate the error in amounts

of receipt as the difference between the survey and the record. In the final step, we calculate the mean error over all cash transfers and respondents.<sup>3</sup>

With INDI, weekly non-labor income is under-reported by on average £4.6 (95% confidence interval (CI) from -9.1 to -0.2). With RDI the error increases to £5.9 (95% CI from -9.9 to -1.9). This suggests that although RDI reduces under-reporting of receipt, it does not help respondents report the amounts received.

### **Effects of RDI on measurement error in duration of receipt**

Third, to assess the effects of RDI on measurement error in reported *duration* of receipt, we again compare the survey and administrative data. For each income source we calculate the error as the difference between the number of months of receipt according to the survey and the records.<sup>4</sup> We then calculate the mean error over all income sources and respondents.

With INDI receipt is under-reported by on average 1 month (95% CI from -1.4 to -0.4). With RDI the mean error is no longer significantly different from zero (95% C.I. from -0.4 to 0.4). This suggests that RDI reduces measurement errors in reported duration of receipt of cash transfers.

### **Effects of RDI on measurement error in transitions of cash transfer receipt across waves**

Fourth, we evaluate whether RDI reduces measurement error in reported *transitions* of receipt across waves. We classify each potential income source for each respondent according to the type of transition between the 2001 survey and the 2003 survey as continued non-receipt, continued receipt, transition off receipt, and transition onto receipt. Each potential income source is classified separately based on the survey data and the record data. We then compare the transition types derived from the survey and records to identify errors in transition classifications.

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<sup>3</sup> The analysis includes sources reported either in the survey, or the records, or both. INDI sources N=278, RDI sources N=306. False positives are counted as true positives, if the source is recorded for a different household member in the record data. In this case, the amount in the survey is compared to the amount in the records for the other household member. The analysis excludes information about Housing Benefit. The record data for Housing Benefit stem from a different source than the other cash transfer types. While the data on dates of receipt appear consistent with the survey data, the data on amounts contain large numbers of inconsistencies which we have not been able to resolve.

<sup>4</sup> The analysis is restricted to receipt between Sept. 1<sup>st</sup> 2001 and Sept. 1<sup>st</sup> 2002, for comparability with the BHPS data. The base includes all sources either reported in the survey, or recorded in the administrative data, or both, but excludes true negatives. As for the previous tables, in the case of over-reporting where a record exists in the name of a different household member, the survey duration is compared to the record duration for the other household member.

Table 7: Effect of RDI on measurement error in transitions onto and off cash transfer receipt, conditional on correct classification in the 2001 survey

Transition according to records	% Misclassified	
	INDI	RDI
Continued non-receipt	0.5	0.5
Transition on	20.4	38.6
Continued receipt	11.3	3.2
Transition off	0.0	13.3

Notes: The sample includes all respondents (INDI=262, RDI=274), multiplied by 14 potential income sources, and excluding sources reported incorrectly in the first interview (INDI=89, RDI=99). INDI: independent interviewing, RDI: reactive dependent interviewing.

Overall, the transition type is misclassified for 4% of potential income sources with both INDI and RDI. Since RDI was only used in the 2003 interview, the interviewing method cannot have affected the wave 2001 status. Therefore Table 7 focuses on errors in the classification of transition types, conditional on the 2001 status being reported correctly in the survey. The rows indicate the respondents' transition statuses (pooled over all potential income sources) according to the records. The columns indicate the percentage of income sources for which the 2003 status was misclassified in the survey, resulting in an error in the transition type.

'Continued non-receipt' is reported well with INDI and not improved with RDI: the error rates are 0.5% with both methods. With RDI more respondents are correctly classified as having 'continued receipt': the error rates are reduced from 11.3% to 3.2%. However respondents who 'transitioned onto' cash transfer receipt are more likely to be mis-classified with RDI: the error rate unexpectedly increases from 20.4% to 38.6%. With RDI respondents are more likely to be misclassified as 'continued non-receipt'. This is a surprising finding, since non-receipt in the previous interview does not trigger any RDI-questions. 'Transitions off' cash transfer receipt tends to be reported correctly with INDI, but the number of transitions is very small. RDI increases the likelihood that 'transitions off' receipt are misclassified as 'continued receipt'. This could be due to respondents falsely confirming a receipt status presented to them from the previous interview. A potential cause of the findings for transitions onto and off receipt could be found with the interviewers. With DI-designs, they might be more focused on reducing errors in continued receipt than in picking up transitions onto and off receipt (Sala, Uhrig, and Lynn 2009). Since the number of transitions onto and off receipt is small, we would however interpret these results with caution.



In sum, RDI reduces various aspects of measurement error in the reporting of State cash transfers: RDI reduces under-reporting of any receipt, of the duration of receipt within one wave, and of continued receipt across waves. RDI does not reduce overall misclassification rates in transitions, although the nature of misclassifications changes.

### **3.3 Generality of the validation results**

A limitation of the validation study is that it contains only data on State cash transfers, not on the other income sources for which RDI is used in the BHPS and which contribute to household income. The validation experiment further contrasted only INDI and RDI and did not use within-wave edit checks. In addition there are some differences in the time frames and sample composition between the validation study and the BHPS, as outlined in Section 2.3. To check whether it is reasonable to assume that the findings from the validation study also apply to the BHPS, whether they might generalise to the other income sources, and maybe also to the within-wave edit checks, we have carried out some further analyses (see Appendix). We examined the following: (1) Comparing the BHPS and validation study, are the effects of RDI on the reporting of income sources for which we have validation data similar? (2) In the BHPS data, are the effects of RDI on the income sources for which we have validation data similar to the effects on income sources for which we have no validation data? (3) In the BHPS data, are the effects of within-wave edit checks similar to the effects of RDI? For this purpose we examined the following, separately for income sources reported in response to the independent question, the within-wave edit check, or RDI: (1) the proportion of total income sources reported in response to the particular question version, (2) the proportion of income sources added that had not already been reported by another household member, or (3) for which the amount received had not already been reported as part of the amount for a different source, (4) the months of receipt, and (5) how transitions in receipt status between waves change if the additional reports are added.

The results suggested that the reporting patterns are similar between the validation study and the BHPS, between income types for which we have or do not have validation data, and for the within-wave edit checks and RDI. We therefore assume that the effects of RDI on measurement error which we find in the validation data are also likely to apply to the BHPS data. We further assume that RDI is likely to reduce measurement error for those income sources for which we do not have validation data, and that the within-wave edit checks also

reduce measurement error. As a result, we assume that the changes we find in estimates related to household income represent improvements in data quality.

#### **4 Discussion and conclusion**

The motivation for this study was to examine what effect methodological innovations, that are expected to reduce measurement error, have on substantive estimates. In this case, whether or not using edit checks to collect income data affects substantive conclusions. Methodological studies designed to evaluate the effects of alternative data collection methods on data quality often only examine answers to individual survey questions. Evaluations of the impact on data quality however further need to relate to the actual uses of the survey data. In this spirit, we examine the effects of within-wave edit checks and RDI on derived estimates, and subsequently whether these effects reflect a decrease in measurement error. For this purpose we exploit a unique combination of data sets: we use data from the BHPS, a large-scale panel survey which has implemented within-wave edit checks and RDI for questions on non-labor income components in a quasi-experimental way, and from an experimental validation study based on the BHPS survey design. We use the experimental study to assess the effects of RDI on different aspects of measurement error, and the BHPS data to assess the effects of RDI and within-wave edit checks on estimates of household income and poverty. The results suggest that both the within-wave edit checks and RDI increase estimates of total household income in the lower tail of the income distribution. Neither method has much effect on estimated poverty rates or estimated rates of transitions into and out of poverty. The increase in household income reflects an increase in data quality: RDI reduces under-reporting without affecting over-reporting; RDI reduces under-reporting of months of receipt and reduces erroneous transitions off income receipt and under-reporting of continued receipt across waves.

The effects of RDI on measurement error are in our view considerable, for example, the under-reporting rate is reduced by about 29% compared to independent interviewing. The effects on estimates of household income and poverty are arguably small. This suggests that while within-wave edit checks and RDI may have large effects on measurement error in responses to individual survey questions, the combined effects, in this case over different survey items and different household members, may be small. This conclusion may however be open to interpretation, since a reduction in the estimated poverty rate by a mere 0.5 percentage points affects around 300,000 individuals in the population of Great Britain. Moreover, RDI and within-wave edit checks were only used for the non-labor components of

income. Measurement errors in labor income, which contributes greatly to household income, are not accounted for.

There are a number of issues, regarding both the effects of RDI and within-wave edit checks, and the mechanisms through which these methods work, which in our view warrant further attention. Reactive and proactive DI have rarely been compared. The reason why RDI was implemented in the BHPS was that this made it possible to maintain comparability with the previous 15 waves of data collection, in which independent interviewing was used. The responses given to the independent question can still be identified and, for comparisons with previous waves, the responses to the reactive follow-up can be ignored.

Our ability to compare the effects of within-wave edit checks and RDI were limited by the fact that both were always used in combination, with the edit checks always preceding the RDI checks. Their relative effects may be quite different if compared individually or in different order. Since the edit checks do not require feeding forward information from previous interviews, they can be used in cross-sectional surveys and are cheaper to implement than RDI. Their use is however restricted to income sources for which there are questions earlier in the questionnaire which are good predictors of eligibility.

The long-term effects of RDI have not been assessed. The ability of RDI to reduce under-reporting is limited by the fact that the respondent can only be reminded of income sources reported in the past. Over time, as under-reporting is reduced with the help of RDI, more information becomes available about which the respondent can be prompted. As a result the reduction of measurement error may well increase, since respondents can be reminded of a larger proportion of the sources they have received in the past.

The extent of measurement error in independent survey questions is presumably affected by the question format. The shortcut method of using showcards instead of separate yes/no questions about the receipt of all potential income sources presumably leads to more under-reporting. On the other hand, the shorter interview time reduces respondent burden, which could lead to less measurement error using the showcards. This trade-off between cost savings in terms of questionnaire time and measurement error has to our knowledge not been assessed.

Finally, we have not touched on the question through which mechanisms RDI and edit checks work, i.e. which types of sources are most likely to be misreported, by which types of respondents, and how the edit checks work for these different groups (see Lynn et al. in press; Pascale, Roemer and Resnick 2009). We have also not touched on the question how these methods could further be improved. These could focus further on the reduction of

underreports, but also on capturing new receipt. This could be done by extending the use of within-wave edit checks by incorporating more factual questions into earlier sections of the questionnaire that predict eligibility for income receipt. Measurement error in household income was reduced by our study design, but there is room for further reductions in error with potentially greater impact on substantive conclusions.

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## Appendix: Effects of DI and edit checks on reporting in the validation study and BHPS data

In the experimental data 7.6% of all cash transfer sources were reported in response to the RDI follow-up questions (Table A1). In the BHPS data at waves 16 and 17, about 2% of all cash transfer sources were reported in response to the within-wave edit checks, and about 7 % in response to the RDI follow-up question. The total proportion of cash transfer sources reported in response to either edit checks or RDI is therefore similar in the BHPS and the validation study. For the other income types for which RDI was used at waves 16 and 17 in the BHPS, the proportion of income sources reported in response to the RDI follow-up was around 5% for private pensions, around 9% for other transfers and around 11% for investment income. RDI therefore had similar effects for these other income types as for cash transfer income.

Table A1: Number and percentage of income sources reported in response to INDI, edit check and RDI, by income type, wave, and data source

		Cash transfers		Pensions		Other transfers		Investment	
		N	%	N	%	N	%	N	%
BHPS-Wave15	INDI	8088	98.6	1717	100.0	426	100.0	274	100.0
	Checks	117	1.4	–	–	–	–	–	–
Wave16	INDI	8170	91.3	1776	93.6	515	90.4	323	89.2
	Checks	165	1.8	–	–	–	–	–	–
	RDI	615	6.9	121	6.4	55	9.7	39	10.8
Wave17	INDI	7895	92.3	1846	95.2	501	91.1	302	87.5
	Checks	157	1.8	–	–	–	–	–	–
	RDI	506	5.9	94	4.9	49	8.9	43	12.5
Experiment	INDI	487	92.4	–	–	–	–	–	–
	RDI	40	7.6	–	–	–	–	–	–

Notes: N are counts of the total number of income sources reported in a wave, over all original respondents. N respondents wave 15:8,538, wave 16:8,484, wave 17:8,322, experimental data: 274. % are column percentages within a wave.

At the household level, 100% of cash transfer sources reported in response to the RDI follow-up in the experimental data were sources that had not already been reported by another household member (Table A2). In the BHPS data at waves 16 and 17, 77.6% and 74.1% of cash transfer sources reported in response to the RDI, and 86.7% and 88.6% of sources in response to the edit checks were unique reports. This suggests that while the percentage of unique reports is somewhat lower in the BHPS than the experimental data, the general trend is similar. The effect of the edit checks was again in the same direction as the effect of RDI. For private pensions the percentage of sources reported in response to RDI, that had not already been reported by another household member, was 94.1% and 100%; for other

transfers 100% and for investment income 63.6% and 64.3%. RDI therefore had similar effects for these additional income types as for cash transfers. Both RDI and edit checks increased the number of unique cash transfers reported at the household level, for all types of non-labor income.

Table A2: Mean number of total and unique income sources reported by households, in response to INDI, edit check and RDI, by income type, wave, and data source

		Cash transfers			Pensions			Other transfers			Investment		
		Mean	Unique	% u	Mean	Unique	% u	Mean	Unique	% u	Mean	Unique	% u
BHPS- Wave15	INDI	2.266	2.001	88.3	.481	.477	99.2	.119	.114	95.8	.077	.051	66.2
	Checks	.033	.023	70.0	–	–	–	–	–	–	–	–	–
Wave16	INDI	2.422	2.117	87.4	.522	.517	99.0	.157	.150	95.5	.100	.063	63.0
	Checks	.045	.039	86.7	–	–	–	–	–	–	–	–	–
	RDI	.170	.132	77.6	.034	.032	94.1	.015	.015	100	.011	.007	63.6
Wave17	INDI	2.405	2.064	85.8	.546	.540	98.9	.154	.148	96.1	.097	.058	59.8
	Checks	.044	.039	88.6	–	–	–	–	–	–	–	–	–
	RDI	.143	.106	74.1	.005	.005	100.0	.015	.015	100	.014	.009	64.3
Experi- ment	INDI	2.706	2.578	95.2	–	–	–	–	–	–	–	–	–
	RDI	.222	.222	100.0	–	–	–	–	–	–	–	–	–

Notes: Mean refers to the mean number of sources reported per household, including households which did not report any income of a particular source. Unique excludes duplicate reports of the same income source by multiple household members. % u indicates the percentage of total reports per household that are unique reports. Number of respondent households at wave 15: 3570, wave 16: 3628, wave 17: 3558, experimental data: 180.

In the experimental data the amounts for 12.5% of cash transfer incomes reported in response to RDI had already been reported as part of a different source (Table A3). This is a bit higher than the percentage in the BHPS cash transfer data at wave 17 (9.5%), but lower than at wave 16 (18.5%). The effect of RDI therefore seems to be similar for the reporting of cash transfer amounts in the BHPS and the experimental data. For the edit checks in the BHPS, the percentage of cash transfer sources for which amounts had already been reported is lower at 5.5% and 4.5%. For the other income types the percentage of RDI reports with zero amounts are also lower, at 9.1% and 5.3% for private pensions, 5.5% and 0% for other transfers, and 5.1% and 2.3% for investment income. The effects of edit checks for cash transfer income and of RDI for the other income types in the BHPS data therefore appear similar to the effects of RDI in the experimental data, in that the majority of additional income reports are associated with additional amounts.

Table A3: Percentage of reported sources with income amounts of zero, in response to INDI, edit check and RDI, by income type, wave, and data source

		Cash transfers	Pensions	Other transfers	Investment
BHPS-Wave15	INDI	6.0	1.0	0.5	1.5
	Checks	8.5	–	–	–
Wave16	INDI	8.2	1.3	0.7	1.7
	Checks	5.5	–	–	–
	RDI	18.5	9.1	5.5	5.1
Wave17	INDI	6.3	0.9	0.5	1.2
	Checks	4.5	–	–	–
	RDI	9.5	5.3	0.0	2.3
Experiment	INDI	4.7	–	–	–
	RDI	12.5	–	–	–

Notes: % is the percentage of respondents who reported receipt of an income source, but said the amount had already been included elsewhere. Based on all income sources reported by respondents, as documented in Table A1.

Table A4: Mean months of receipt in response to INDI, edit check and RDI, by income type, wave, and data source

		Cash transfers	Pensions	Other transfers	Investment
BHPS-Wave 15	INDI	10.7	11.3	7.0	9.7
	Checks	10.6	–	–	–
Wave 16	INDI	10.8	11.0	7.8	9.7
	Checks	8.6	–	–	–
	RDI	9.9	10.5	8.3	9.1
Wave 17	INDI	10.7	11.0	7.5	10.2
	Checks	7.5	–	–	–
	RDI	10.0	9.7	8.8	9.0
Experiment	INDI	11.5	–	–	–
	RDI	9.6	–	–	–

Notes: The maximum duration of a spell is 12 months (1 Sept. – 1 Sept.). If a respondent reported two spells of receipt of the same income type within one year, the total number of months of receipt is counted, regardless of whether these were part of only one or multiple spells. Based on the number of income sources documented in Table A1.

In both the experimental data and the BHPS, the mean duration of receipt of cash transfers is around 11 months in the INDI data, and around 10 months in the RDI data (Table A4). The effect of RDI on reporting of duration of receipt therefore appears similar in the BHPS and experimental data. With edit checks the mean duration of receipt for BHPS cash transfer income is slightly lower, at around 8 months. For the other income types, the mean durations in the INDI data are around 11 months for pensions, 7 to 8 months for other transfers and around 10 months for investment income. In each case, the mean duration of receipt with DI is similar to that with INDI. This suggests that the effect of DI on reporting of durations of cash transfer receipt is similar in the experimental and the BHPS data. The effects of the edit checks go in the same direction, and the effects of DI for the other income types are also similar to those for cash transfer income.



In both the experimental data and the BHPS data, RDI increases the percentage of transitions onto receipt and of continued receipt, while it decreases the percentage of transitions off cash transfer receipt and of continued non-receipt (Table A5). The effects of edit checks in the BHPS cash transfer data are similar for all transition types, as are the effects of RDI for the other income types. Although all effects are small, we conclude that the effects of DI are similar in the BHPS and experimental data, that the effects of the edit checks go in the same direction, and that the effects of DI on the other types of non-labor income are similar to the effects for cash transfer income.

Table A5: Transitions onto and off income receipt between waves in response to INDI, edit check and RDI, by income type, wave, and data source

Wave $t-1$ receipt status		Wave $t$ receipt status						
		INDI		INDI + checks		INDI + checks + RDI		
Income	Waves		0	1	0	1	0	1
Cash transfers	15-16	0	94.53	1.07	94.19	1.41	–	–
		1	0.90	3.50	0.81	3.58	–	–
	16-17	0	94.47	1.00	94.13	1.33	93.99	1.47
		1	0.96	3.57	0.90	3.64	0.25	4.29
	Experiment*	0	90.53	2.11	–	–	90.49	2.14
		1	1.39	5.97	–	–	0.76	6.60
Pensions	16-17	0	92.02	0.95	–	–	91.86	1.08
		1	1.70	5.33	–	–	1.32	5.74
Other transfers	16-17	0	98.84	0.38	–	–	98.80	0.42
		1	0.40	0.38	–	–	0.18	0.60
Investment	16-17	0	97.58	0.62	–	–	97.52	0.68
		1	0.62	1.18	–	–	0.16	1.64

Notes: Numbers are cell percentages for each 2 by 2 transition matrix. Receipt status 0:no receipt, 1:receipt.

\* No edit checks were used in the experiment, therefore the final two columns refer to INDI + RDI in the case of the experimental data. Based on the number of respondents multiplied by the number of potential income sources. Number of respondents for transitions between waves 15 and 16:7,820 , waves 16 and 17: 7,709, experimental data: 274.